

For land resources, the construction of all four of the disposition facilities would disturb up to 191 ha (472 acres) of land during construction, of which up to 133 ha (330 acres) would be used during operations. If all four of the facilities were located at the same site, there would likely be a reduced area of disturbed land due to the sharing of land resources. Construction and operation of the disposition facilities could also result in the direct disturbance of terrestrial resources, wetlands, and threatened and endangered species.

The construction and operation of the disposition facilities could affect cultural and paleontological resources by disturbing Native American and buried paleontological materials. Constructing and operating the disposition facilities would generate employment and income increases in the region.

During normal operations of the disposition facilities, there would be both radiological and chemical releases to the environment and direct in-plant worker exposures. However, exposures are expected to be within regulated limits. To the extent possible, existing treatment systems would be used for the waste streams from the disposition facilities. If the capacity or appropriate treatment technology are not available, new treatment facilities would be built to handle the waste from the new facilities.

Preferred Alternative

Under the Preferred Alternative for disposition, Hanford and SRS are potential sites for four facilities (pit disassembly/conversion, Pu conversion, MOX fuel fabrication, and immobilization), therefore, the maximum contribution to cumulative impacts would result at these sites if all four facilities were constructed. INEL and Pantex are potential sites for two facilities (pit disassembly/conversion and MOX fuel fabrication), therefore, the maximum contribution to cumulative impacts at these sites would result if both of these facilities were constructed. Based on the cumulative impact analysis for the disposition alternatives described above, the following resource areas and issues were identified as having the potential to result in cumulative impacts:

- At Hanford, potential cumulative impacts were identified for land resources, site infrastructure, air quality, biological resources, cultural and paleontological resources, socioeconomics (local transportation), and waste management.
- At INEL, potential cumulative impacts were identified for land resources, site infrastructure, air quality, biological resources, cultural and paleontological resources, socioeconomics (local transportation), and waste management.
- At Pantex, potential cumulative impacts were identified for land resources, site infrastructure, air quality, water resources, cultural and paleontological resources, socioeconomics (local transportation), and waste management.
- At SRS, potential cumulative impacts were identified for land resources, site infrastructure, air quality, biological resources, cultural and paleontological resources, socioeconomics (local transportation), public and occupational health and safety, and waste management.

S.8 COMPARISON OF ALTERNATIVES

The environmental impacts of the storage and disposition alternatives, including the Preferred Alternative, are compared in this section. The emphasis is on those environmental resources and issues that discriminate between the alternatives and are of interest to the public. Detailed comparison tables, including each alternative and each resource and issue, are contained in Chapter 2 of the PEIS. Within this Chapter, Table 2.5-1 provides a summary of environmental impacts for the Preferred Alternative for storage; Table 2.5-2 provides a comparison of environmental impacts for the No Action and long-term storage alternatives; and Table 2.5-3 provides a comparison of environmental impacts for disposition alternatives (including the Preferred Alternative).

LONG-TERM STORAGE

Tables S.8–1 through S.8–6 present a comparison of the key environmental impacts for the long-term storage alternatives and the Preferred Alternative for storage. As discussed in Section S.2, the Preferred Alternative for storage is a combination of No Action and Upgrade Alternatives for the various DOE sites, and phaseout of Pu storage at RFETS.

For all of the storage sites, the No Action Alternative is used as a baseline from which incremental impacts of the storage alternatives are compared. The phaseout associated with these storage alternatives could reduce human health and waste generation impacts and increase the number of lost jobs at some sites.

Site Infrastructure. For the Upgrade Alternatives, all requirements would be within existing site capacities for all sites except for coal at ORR and SRS. Under the Preferred Alternative, coal consumption at ORR and SRS would exceed site storage capacities by less than 1 percent; all other requirements would be within existing site capacities. In those cases where site capacity for fuel storage does not adequately support increased requirements, more frequent deliveries would be scheduled. Increases in resource requirements would be within the following ranges over No Action: electrical energy, 0 to 104 percent (maximum for Pantex); peak electric load, 0 to 90 percent (maximum for Pantex); oil, 0 to 13 percent (maximum for INEL for the Upgrade Alternative); natural gas, 0 to 71 percent (maximum for Pantex); and coal, 0 to 1 percent (maximum for ORR).

For the Consolidation Alternatives, all requirements would be within existing site capacities at all sites except for the following: electrical energy (12 percent over existing capacity), oil (1 percent over existing capacity), and natural gas (no existing capacity) at NTS; coal at INEL (97 percent over existing capacity); and oil (1 percent over existing capacity) and coal (2 percent over existing capacity) at SRS. In these cases where site capacity for fuel storage does not adequately support increased requirements, more frequent deliveries would be scheduled. Increases in resource requirements would be within the following ranges over No Action: electrical energy, 8 to 104 percent (maximum for Pantex); peak electric load, 9 to 90 percent (maximum for Pantex); oil, 1 to 5 percent (maximum for Pantex); natural gas, 0 percent (no existing capacity at NTS); and coal, 0 to 97 percent (maximum for INEL). All infrastructure requirements could be met by increasing procurement or, in the case of NTS, by using a different energy source.

For the Collocation Alternatives, all requirements would be within existing site capacities at all sites except for the following: electrical energy (21 percent over existing capacity), oil (1 percent over existing capacity), and natural gas (no existing capacity) at NTS; coal at INEL (124 percent over existing capacity); oil (3 percent over existing capacity), and coal (35 percent over existing capacity) at ORR; and oil (1 percent over existing capacity) and coal (3 percent over existing capacity) at SRS. In these cases where site capacity for fuel storage does not adequately support increased requirements, more frequent deliveries would be scheduled. Increases in resource requirements would be within the following ranges over No Action: electrical energy, 8 to 126 percent (maximum for Pantex); peak electric load, 9 to 100 percent (maximum for Pantex); oil, 1 to 14 percent (maximum for ORR); natural gas, 0 percent (no existing capacity at NTS); and coal, 0 to 124 percent (maximum for INEL).

Soil, Cultural, and Paleontological. Ground disturbance during construction activities would potentially impact soil; cultural resources (including historic, prehistoric, and Native American); and paleontological resources. The Upgrade Alternatives and the Preferred Alternative would have fewer impacts because they use existing facilities or involve only small areas of ground disturbance. The Consolidation and Collocation Alternatives would have more impacts because they involve more ground disturbance due to the construction of new facilities.

Land Use and Visual Resources. For land use, the larger facilities associated with Consolidation and Collocation Alternatives would use more land (56 to 87 ha [138 to 215 acres]) than the facilities associated with Upgrade and Preferred Alternatives (0 to 0.1 ha [0 to 0.25 acres]). The Collocation Alternative at ORR would

change the current VRM Class 4 designation of the Bear Creek Road/Route 95 intersection to Class 5. Visual resources at the other DOE sites would not be affected by the storage alternatives because the facilities would be located near other similar structures.

Air Quality and Noise. Since the Collocation and Consolidation Alternatives would result in more air emission sources (exhaust from delivery trucks, generators, and boilers), slightly greater air quality impacts would occur than with the Upgrade and Preferred Alternatives. The more extensive ground disturbance during construction associated with the Consolidation and Collocation Alternatives would also result in higher levels of PM₁₀ and TSP than for the Upgrade and Preferred Alternatives. Potential air emissions for all of the alternatives are within applicable Federal, State, and local air quality standards and guidelines. Minimal noise impacts would be expected from the storage alternatives because of the remote location of the facilities that would be modified or constructed.

Socioeconomics. Beneficial impacts to regional employment would be expected from all storage alternatives at all storage sites (Table S.8-1) except for the site (or sites depending on the alternative) where storage would be phased out. Collocation would generate the largest employment, followed by the Consolidation, Upgrade, and Preferred Alternatives. However, the phaseout at RFETS associated with the Preferred Alternative would result in the loss of approximately 2,200 direct jobs. Due to the small number of the new jobs created by the alternatives relative to the size of the regional economies at all of the DOE sites, community services would not be affected by the long-term storage alternatives. Short-term local transportation impacts may result at all sites from the construction of the facilities associated with the storage alternatives. The larger construction projects (Collocation and Consolidation Alternatives) would have a greater potential to cause short-term congestion on local roads than the smaller construction projects (the Upgrade and Preferred Alternatives).

Table S.8-1. Maximum Incremental Direct Employment Over No Action Generated During Operations at Each Candidate Site

Site	Total Site Employment in 2005	Upgrade	Consolidation	Collocation	Preferred Alternative
Hanford	14,586	252 ^a	443	572	0
NTS	3,800	NA	527 ^b	641 ^b	0
INEL	6,911	116 ^a	432	561	0
Pantex	3,559	90 ^c	509 ^d	601	90 ^e
ORR	18,010	111	^f	566 ^g	111
SRS	16,562	30 ^h	485	614	30 ^{h,i}

^a Upgrade with RFETS and LANL materials.

^b Modify P-Tunnel.

^c Upgrade with RFETS and LANL materials. Actual number of employees during operation could be higher.

^d Construct new and modify existing storage facilities.

^e Upgrade with pits from RFETS.

^f Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.

^g Construct new Pu and HEU facilities.

^h Workers would be supplied from existing site workforce.

ⁱ Upgrade with non-pit materials from RFETS.

Note: NA=not applicable.

Water Resources. The water resource impacts for the Consolidation and Collocation Alternatives are greater than for the Upgrade and Preferred Alternatives, both in water requirements and wastewater discharges. Wastewater discharge is dependent on the number of employees, which is greatest for the Consolidation and Collocation Alternatives due to the larger facilities. As shown in Table S.8-2, water resource requirements are the greatest for the Collocation Alternative at all DOE sites because collocation includes the maximum amount of Pu and HEU in the PEIS. Water resource requirements for all the alternatives would impact groundwater

availability at Pantex because the additional groundwater withdrawal would contribute to the existing overall decline in water levels of the Ogallala Aquifer. However, there should be minimal impacts to regional groundwater levels from this additional withdrawal. At all other sites, water requirements would have minimal impact on water resources because of the abundance of surface water or groundwater.

Table S.8-2. Maximum Annual Net Incremental Water Usage Over No Action During Operation at Each Candidate Site

Site	No Action in 2005 (MLY)	Upgrade (MLY)	Consolidation (MLY)	Collocation (MLY)	Preferred Alternative (MLY)
Hanford	195	8.9 ^a	110	150	0
NTS	2,400	NA	130 ^b	190 ^b	0
INEL	7,570	22 ^a	66	87	0
Pantex	249	110 ^a	110 ^c	130	27.5 ^d
ORR	14,760	0.24	^e	360 ^f	0.24
SRS	13,247	7.1 ^a	360	460	5.7 ^g

^a Upgrade with RFETS and LANL materials.

^b Modify P-Tunnel.

^c Construct new and modify existing storage facility.

^d Upgrade with pits from RFETS.

^e Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.

^f Construct new Pu and HEU facilities.

^g Upgrade with non-pit materials from RFETS.

Note: MLY=million liters per year; NA=not applicable.

Biological Resources. The Preferred Alternative would have no incremental biological resource impacts at INEL and Hanford, and minimal impacts at Pantex and potentially at SRS because of ground disturbance for upgrades. The Consolidation and Collocation Alternatives would have the potential to impact biological resources at all DOE sites because they would involve ground disturbance. At Pantex, previously disturbed land would be used for consolidation and collocation facilities. Threatened and endangered species at NTS and SRS may be affected by the storage alternatives at these sites.

Environmental Justice. All six DOE storage sites have, within an 80-km (50-mi) radius, census tracts with greater than 25 percent minority or low-income populations. However, the public health and safety analyses show that air emissions and hazardous chemical and radiological releases from normal operations for all storage alternatives would be within regulatory limits and that no latent cancer fatalities would result. The public health and safety analyses also indicate that radiological releases from accidents would not result in disproportionate and adverse human health or environmental impacts. Potential transportation accidents would be random events along transportation corridors. Therefore, none of the storage alternatives would have disproportionately high or adverse impacts on minority or low-income populations.

Waste Management. All of the storage alternatives would impact existing waste management practices at the DOE sites by increasing the amount of waste that must be treated, stored, and disposed. Depending on decisions in the waste-type-specific RODs for the Waste Management PEIS, wastes would be treated and disposed of onsite or at regionalized or centralized DOE sites. Generally, the Consolidation and Collocation Alternatives would generate more wastes than the Upgrade and Preferred Alternatives. Tables S.8-3 through S.8-5 show the maximum incremental waste generation rates for solid TRU, solid low-level, and solid hazardous wastes at the six candidate sites.

Public and Occupational Health and Safety. Table S.8-6 shows the differences between the long-term storage alternatives for radiological exposures to the public. The maximum potential latent cancer fatalities over No

Action for the MEI over 50 years from normal operations ranges from 4.5×10^{-13} for the Upgrade and Preferred Alternatives at Pantex to 1.1×10^{-9} for the Collocation Upgrade Alternative at ORR. This means that the chance of a latent cancer fatality occurring ranges from about 1 in 1 billion to 5 in 10 trillion. The risk varies because of site parameters including the distance from the facility to the MEI (small sites vs. large sites); local meteorological conditions (windspeed, direction, and stability); and the type of material being stored (metals and oxides vs. residues).

Table S.8-3. Maximum Annual Net Incremental Volume of Solid Low-Level Waste Over No Action Generated During Operations at Each Candidate Site

Site	Waste Generated in 2005 (m ³)	Upgrade (m ³)	Consolidation (m ³)	Collocation (m ³)	Preferred Alternative (m ³)
Hanford	3,390	89 ^a	1,260	1,300	0
NTS	15,000	NA	1,260	1,300	0
INEL	7,200	500 ^a	1,260	1,300	0
Pantex	32	1,260 ^a	1,260	1,300	138 ^b
ORR	7,320	3	^c	1,300 ^d	3
SRS	16,400	0	1,220 ^e	1,260 ^e	0

^a Upgrade with RFETS and LANL materials.

^b Upgrade with pits from RFETS.

^c Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.

^d Construct new Pu and HEU facilities.

^e Net waste from new facility and from phaseout of existing facility.

Note: NA=not applicable.

Table S.8-4. Maximum Annual Net Incremental Volume of Solid Transuranic Waste Over No Action Generated During Operations at Each Candidate Site

Site	Waste Generated in 2005 (m ³)	Upgrade (m ³)	Consolidation (m ³)	Collocation (m ³)	Preferred Alternative (m ³)
Hanford	271	21 ^a	10	10	0
NTS	0	NA	10	10	0
INEL	3.5	2 ^a	10	10	0
Pantex	0	10 ^a	10	10	0.8 ^b
ORR	119	0	^c	10 ^d	0
SRS	338	0	2 ^e	2 ^e	0

^a Upgrade with RFETS and LANL materials.

^b Upgrade with pits from RFETS.

^c Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.

^d Construct new Pu and HEU facilities.

^e Net waste from new facility and from phaseout of existing facility.

Note: NA=not applicable.

Table S.8–5. Maximum Annual Net Incremental Volume of Solid Hazardous Waste Over No Action Generated During Operations at Each Candidate Site

Site	Waste Generated in 2005 (m ³)	Upgrade (m ³)	Consolidation (m ³)	Collocation (m ³)	Preferred Alternative (m ³)
Hanford	560	4	2	2	0
NTS	212	NA	2	2	0
INEL	1,200	1	2	2	0
Pantex	31	2 ^a	2	2	1.5 ^b
ORR	26	0.8 ^c	^d	2 ^e	0.8
SRS	15,100	0.8 ^a	2	2	0.6 ^f

^a Upgrade with RFETS and LANL materials.

^b Upgrade with pits from RFETS.

^c Total of mixed LLW and hazardous waste because hazardous waste is included in mixed LLW.

^d Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.

^e Construct new Pu and HEU facilities.

^f Upgrade with non-pit materials from RFETS.

Note: NA=not applicable.

Table S.8–6. Maximum Latent Cancer Fatalities Over No Action for Maximally Exposed Individual for 50 Years From Normal Operations at Each Candidate Site

Site	No Action in 2005	Upgrade	Consolidation	Collocation	Preferred Alternative
Hanford	1.0×10^{-8}	4.5×10^{-11}	6.2×10^{-11}	6.2×10^{-11}	0
NTS	1.0×10^{-7}	NA	1.4×10^{-10}	1.4×10^{-10}	0
INEL	4.4×10^{-7}	1.3×10^{-11}	4.0×10^{-11}	4.0×10^{-11}	0
Pantex	1.5×10^{-9}	4.5×10^{-13}	2.4×10^{-10}	2.4×10^{-10}	4.5×10^{-13}
ORR	3.5×10^{-8}	5.5×10^{-13}	^a	1.1×10^{-9}	5.5×10^{-13}
SRS	2.0×10^{-5}	2.1×10^{-10}	3.5×10^{-10}	3.5×10^{-10}	2.1×10^{-10}

^a Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.

Note: NA=not applicable.

Potential accidents were postulated for each of the long-term storage alternatives. The risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for the accident scenario evaluated with the highest risk (PCV penetration by corrosion) for the Upgrade Alternative would be: 4.3×10^{-4} at Hanford; 1.6×10^{-3} at INEL; 8.8×10^{-4} at Pantex (Preferred Alternative); 3.0×10^{-5} at ORR (Preferred Alternative); and 4.6×10^{-4} at SRS. For both the Consolidation and Collocation Alternatives, the highest risk to the population located within 80 km (50 mi) of the accident release point associated with the accident scenarios evaluated (PCV penetration by corrosion) would be: 4.2×10^{-3} at Hanford; 5.1×10^{-5} / 9.4×10^{-5} at NTS (P-Tunnel/New Pu and HEU Facility); 1.2×10^{-3} at INEL; 1.4×10^{-3} at Pantex; and 1.7×10^{-2} at ORR; and 4.6×10^{-3} at SRS. Since Pu accidents dominate the accident spectrum, the risks would be higher for the Consolidation and Collocation Alternatives because these alternatives would require more Pu at a single DOE site than the Upgrade Alternative.

Intersite Transportation. For intersite transportation, the Upgrade and Preferred Alternatives would have lower potential for fatalities. For the Preferred Alternative, the number of potential fatalities ranges from 0 at Hanford and INEL (since there is no transport of material) to 0.06 at SRS. The Consolidation and Collocation Alternatives would have the higher potential for intersite transportation fatalities because they would move the greatest amount of material between sites. The number of potential fatalities ranges from 0.079 (Consolidated Storage Alternative at Pantex) to 1.07 (Collocated Storage Alternative at Hanford). Intersite transportation impacts would primarily result from nonradiological sources, such as fatalities from nonradiological traffic accidents.

DISPOSITION ALTERNATIVES

Table S.8–7 depicts total campaign data for the disposition alternatives including the Preferred Alternative for disposition. A total of approximately 50 t (55.1 tons) of surplus Pu is assumed to be processed over the life of the campaign. In preparation for disposition under any alternative, surplus Pu must be processed through either the pit disassembly/conversion facility or the Pu conversion facility. Approximately 32.5 t (35.8 tons) are assumed to be processed at the pit disassembly/conversion facility, and approximately 17.5 t (19.3 tons) at the Pu conversion facility. Since these two facilities produce the input material for the other disposition facilities, actions at these two facilities would be the first to occur for the campaign. The operating period for these two facilities for each disposition alternative, including the Preferred Alternative, is 10 years.

Table S.8–7. Total Campaign Data (Approximate) for Disposition Alternatives and the Preferred Alternative

Action	Disposition Alternatives			Preferred Alternative		
	Total Pu (t)	Throughput (t/yr)	Years In Operation	Total Pu (t)	Throughput (t/yr)	Years In Operation
Pit disassembly/ conversion	32.5	3.25	10	32.5	3.25	10
Pu conversion	17.5	1.75	10	17.5	1.75	10
Direct to borehole	50	5	10	NA	NA	NA
Immobilized to borehole	50	5	10	NA	NA	NA
Vitrification	50	5	10	17.5 ^a	5 ^a	3.5 ^a
Ceramic immobilization	50	5	10	17.5 ^a	5 ^a	3.5 ^a
Electrometallurgical treatment	50	5	10	NA	NA	NA
MOX fuel fabrication	50	3	17	32.5	3	11
5 Existing LWRs ^b	50	3	17	32.5	3	11
2 Partially completed LWRs ^c	50	3	17	NA	NA	NA
2 Large or 4 small evolutionary LWRs	50	3	17	NA	NA	NA
CANDU reactors ^d	50	3.8	13	NA	NA	NA

^a Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

^b Three to five existing LWRs would be used depending upon the amount of MOX fuel in the reactor core.

^c If the partially completed LWRs were to be completed by other parties, they would be considered existing LWRs and could compete for the surplus Pu disposition mission under the Preferred Alternative.

^d The CANDU reactor is retained in the event a multilateral agreement is made among Russia, Canada, and the United States to use CANDU reactors.

Note: NA=not applicable.

The operation of the disposition facilities for a single disposition alternative would require between 10 and 17 years to accomplish the disposition mission. However, the Preferred Alternative may result in fewer years of operation for the disposition facilities, since the 50 t (55.1 tons) of surplus Pu would be dispositioned under two different technologies. For purposes of analysis, it is assumed that approximately 17.5 t (19.3 tons) of surplus Pu would be immobilized through vitrification or ceramic immobilization, and approximately 32.5 t (35.8 tons) would be converted to MOX fuel for use in reactors,²⁰ under the Preferred Alternative. The number of years in

²⁰ The actual amount dispositioned under each disposition technology would depend on subsequent NEPA analysis, costs, test and demonstration results, international agreements, and the procurement process among other things.

operation for each disposition technology may be less than that required to process the full 50 t (55.1 tons) with any single disposition alternative.

Actual years of operation and Pu throughput rates for any of the reactor disposition alternatives would not exceed 17 years and 3.8 t/yr (4.2 tons/yr), respectively, but could be less depending upon the final reactor core design. Variables such as the amount of MOX fuel included in each core have not yet been determined and would affect the years required to complete the mission using the reactor alternatives. Conservative estimates for throughput and years in operation are presented for comparing the Reactor Alternatives with the Preferred Alternative.

Table S.8-8 presents a comparison of the total campaign impacts from the disposition of 50 t (55.1 tons) of surplus Pu for key environmental resources for the individual disposition alternatives and the Preferred Alternative. Since the ceramic immobilization facility generally has greater impacts than the vitrification facility, it was used in the calculation of the total campaign impacts for the Preferred Alternative. A comparison of impacts is not included for community services, environmental justice, and noise since the impacts are highly site-specific.

Biological, Geology and Soil, Land Use, and Cultural and Paleontological Resources. Ground disturbance during construction activities would potentially impact soil; biological; cultural resources (including historic, prehistoric, and Native American); and paleontological resources for all of the disposition alternatives. The immobilization alternatives would disturb the least amount of land while the Evolutionary LWR Alternative would disturb the most land area because it would require the most new construction. However, when considering operational land area, the two Deep Borehole Alternatives would require the most land because of the 1.6-km (1-mi) radius buffer zone. Depending upon location, all of the alternatives could result in visual resource impacts by changing the visual resource management classification of an area. The Deep Borehole Alternatives would impact geologic resources because the borehole operations would render the site perpetually unusable.

Site Infrastructure and Water Resources. The evolutionary LWR would require the largest electrical load during operations. The Evolutionary LWR and the Partially Completed LWR Alternatives would require the most additional water for operations. The rest of the alternatives would require nearly the same amount of water, with the exception of the Electrometallurgical Treatment Alternative, which would require the least amount of water.

Air Quality and Socioeconomics. Potential construction-related impacts on air quality and local transportation would be minor for all of the disposition alternatives and the Preferred Alternative. The Evolutionary LWR and Partially Completed LWR Alternatives would generate the most employment and income among the alternatives. For local transportation, the Evolutionary LWR Alternative would have the greatest potential of reducing the level of service on local roads during construction and/or operations. Some reduction in level of service would also be expected for the Vitrification, Ceramic Immobilization, and the Preferred Alternatives.

Public and Occupational Health and Safety. There would be potential for impacts to public and occupational health and safety from the radiological and hazardous chemical doses during operations of all the disposition alternatives, including the Preferred Alternative; however, the annual radiological doses to onsite workers and the public would be within regulatory limits for all alternatives. For hazardous chemicals, potential impacts to the public and onsite workers would not be expected to cause adverse health affects.

A set of potential accidents was postulated for each of the disposition technology alternatives. The risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for the front-end disposition process campaign would range from 4.5×10^{-16} to 1.7×10^{-4} for pit disassembly/conversion (for the highest accident risk scenario [fire on loading dock] at the potential disposition sites: 4.6×10^{-5} at Hanford; 1.4×10^{-5} at INEL; 1.6×10^{-5} at Pantex; and 5.0×10^{-5} at SRS) and from 1.5×10^{-16} to 1.3×10^{-4} for Pu conversion

Table S.8–8. Comparison of Resource Use and Impacts From the Total Campaign for the Operation of Disposition Alternatives^a

Alternatives	Total Number of Worker-Years	Water Usage (million l)	Latent Cancer Fatalities for MEI from Lifetime Accident-Free Operation	Solid TRU Waste Generated (m ³)	Solid Low-Level Waste Generated (m ³)	Solid Hazardous Waste Generated (m ³)
Direct to borehole	20,550	3,405	1.2x10 ⁻⁹ to 1.2x10 ⁻⁷	3,452	18,500	287
Immobilized to borehole	29,550	6,605	1.2x10 ⁻⁹ to 1.2x10 ⁻⁷	4,955	18,740	497
Vitrification	24,810	4,251	1.2x10 ⁻⁹ to 1.2x10 ⁻⁷	4,440	18,590	307
Ceramic immobilization	25,730	4,251	1.2x10 ⁻⁹ to 1.2x10 ⁻⁷	4,440	18,590	307
Electrometallurgical treatment	17,960	1,751	1.2x10 ⁻⁹ to 1.3x10 ⁻⁷	3,510	19,000	125
5 Existing LWRs ^b	29,030	2,717	1.3x10 ⁻⁶ to 2.6x10 ⁻⁶	8,652	21,051	2,718
2 Partially completed LWRs ^c	47,305	2,352,000	9.8x10 ⁻⁶ to 9.9x10 ⁻⁶	8,652	22,955 to 42,709	3,636
2 Evolutionary large LWRs ^d	53,850	2,062,000	5.8x10 ⁻⁷ to 8.2x10 ⁻⁵	8,652	38,051	3,636
4 Evolutionary small LWRs ^e	59,630	1,856,000	8.4x10 ⁻⁷ to 9.6x10 ⁻⁵	8,652	39,411	4,554
CANDU reactors ^f	25,630	2,717	1.8x10 ⁻⁹ to 1.2x10 ⁻⁷	8,652	21,051	2,718
Preferred Alternative ^g	16,140	3,253	9.0x10 ⁻⁷ to 1.7x10 ⁻⁶	7,163	20,182	1,866

^a Data includes all front-end processes (Pu conversion, pit disassembly/conversion, and MOX fuel fabrication) that would be needed for the individual alternatives. The total campaign impacts were calculated by multiplying the annual impacts times the number of years of operation, as identified in Table S.8–7.

^b The table reflects the use of 5 existing LWRs. Three to five existing LWRs would be used depending upon the amount of MOX fuel in the reactor core.

^c The table reflects the use of 2 partially completed LWRs.

^d The table reflects the use of 2 evolutionary large LWRs.

^e The table reflects the use of 4 evolutionary small LWRs.

^f The table reflects impacts from pit disassembly/conversion and MOX fuel fabrication in the United States.

^g Ceramic immobilization and 5 existing LWRs are the assumed technologies for the Preferred Alternative for comparative purposes only.

(for the highest accident risk scenario [fire on loading dock] at the potential disposition sites: 3.5x10⁻⁵ at Hanford and 3.2x10⁻⁵ at SRS). Within the borehole category, the risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for direct disposition campaign would range from 8.4x10⁻¹⁶ to 6.3x10⁻⁸. For both the ceramic immobilization front-end process prior to immobilized disposal, and ultimate disposition in the deep borehole complex, the risks would range from 9.3x10⁻¹⁸ to 6.3x10⁻⁸ and 9.3x10⁻¹⁹ to 6.3x10⁻⁹, respectively for the disposition campaign. The risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for the immobilization category would range from 2.8x10⁻¹⁴ to 1.8x10⁻⁵ for the vitrification alternative and from 7.0x10⁻¹⁶ to 1.9x10⁻⁷ for the ceramic